

In the claims:

10/529099
JC17 Rec'd PCT/PTO 24 MAR 2005

1. (original) A method of creating a layer of electrically insulating material in a thin-film structure, the method comprising the steps of coating a substrate in one pass with an ink having a major, fugitive component and at least one minor, non-fugitive component and treating the ink to expel said major component to leave said layer of electrically insulating material, wherein said layer of electrically insulating material has a thickness in the range 0.5 to 10 micrometres, and said ink contains non-fugitive colloidal ceramic nanoparticles having a size in the range 10 to 100 nanometres.
2. (original) A method according to claim 1, wherein said nanoparticles comprise one or more simple or compound oxide, containing cations of one or more element.
3. (original) A method according to claim 2, wherein said one or more element is selected from the group comprising nitrides, oxynitrides, borates, silicates and phosphates.
4. (currently amended) A method according to claim 1, ~~2 or 3~~, wherein said ink comprises an insulator precursor selected from the group comprising sols, organometallics and organic compounds containing non-metallic elements.
5. (original) A method according to claim 4, wherein said ink comprises an insulator precursor selected from the group comprising silica sol, polysiloxanes, silsesquioxane polymers, -chloroethylsilsesquioxane, hydrogensilsesquioxane, acetoxysilsesquioxane and H_3BO_3 .
6. (original) A method of creating a process control layer of a material in a thin-film structure, the method comprising the steps of coating a substrate in one pass with an ink having a major, fugitive component and at least one minor, non-fugitive component and treating the ink to expel said major component to leave said layer of material.

7. (original) A method according to claim 6, wherein said process control layer is an etch stop layer.
8. (original) A method according to claim 7, wherein said etch stop layer is adapted to resist fluorine chemistry etching.
9. (currently amended) A method according to claim 7 ~~or~~ 8, wherein said ink comprises a precursor for the process control layer which comprises at least one selected from the group comprising soluble compounds of the transition metals and sols of transition metal oxides.
10. (original) A method according to claim 9, wherein said transition metals have an atomic number in the range 21 to 30.
11. (original) A method according to claim 10, wherein said transition metal is chromium.
12. (original) A method according to claim 11, wherein said precursor comprises $\text{Cr}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$.
13. (original) A method according to claim 6, wherein said process control layer is a barrier layer.
14. (original) A method according to claim 13, wherein said ink comprises a precursor for said layer that is selected from the group comprising silica sol, alumina sols, titania sol, alumina sol plus a soluble phosphate, alumina sol plus a soluble organophosphate, polysiloxanes, silsesquioxane polymers, -chloroethylsilsesquioxane, hydrogensilsesquioxane and acetoxysilsesquioxane.
15. (original) A method of creating an optically emissive layer of material in a thin-film structure, the method comprising the steps of coating a substrate in one pass with an ink having a major, fugitive component and at least one minor, non-fugitive component

and treating the ink to expel said major component to leave said optically emissive layer of material.

16. (original) A method according to claim 15, wherein said optically emissive layer of material comprises a phosphor.

17. (original) A method according to claim 16, wherein said ink contains phosphor that has been added in dry, free-flowing powdered form, with a particle size in the range 1 to 10 micrometers.

18. (original) A method according to claim 17, wherein said particle size is in the range 3 to 5 micrometers.

19. (currently amended) A method according to claim 15 ~~any of claims 15 to 18~~, wherein said ink comprises a soluble silica precursor comprising an oxide sol or organometallic complex soluble in the solvents used in the ink.

20. (currently amended) A method according to ~~any of the preceding claims~~ claim 1, wherein the step of treating the ink comprises subjecting the ink to ultra-violet radiation.

21. (original) A method of creating a layer of a material of predetermined electrical conductivity in a thin-film structure, the method comprising the steps of coating a substrate in one pass with an ink having a major, fugitive component and at least one minor, non-fugitive component and treating the ink to expel said major component to leave said layer of material, wherein said minor, non-fugitive component comprises one or more soluble ceramic precursor.

22. (original) A method according to claim 21, wherein said minor, non-fugitive component comprises colloidal ceramic nanoparticles having a size in the range 10 to 100 nanometres.

23. (currently amended) A method according to claim 21, ~~or 22~~, wherein said soluble ceramic precursor comprises one or more soluble compound of a metallic element that is a transition metal, rare earth element or main group element.
24. (original) A method according to claim 23, wherein said one or more soluble compound is selected from the group comprising $\text{La}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$, $\text{Sr}(\text{NO}_3)_2 \cdot 2\text{H}_2\text{O}$, $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$, $\text{Al}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$, $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$, $\text{Ni}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$, $\text{In}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$, $\text{Fe}(\text{NO}_3)_3 \cdot 6\text{H}_2\text{O}$ and AgNO_3 .
25. (currently amended) A method according to claim 21 ~~any of claims 21 to 24~~, wherein said soluble ceramic precursor comprises one selected from the group comprising sols, organometallics and organic compounds containing non-metallic elements.
26. (currently amended) A method according to ~~any of the preceding claims~~ claim 1, wherein the step of treating the ink comprises pyrolysing the ink.
27. (original) A method according to claim 26, wherein said ink is pyrolysed at a temperature that is equal to or greater than 400C.
28. (currently amended) A method according to ~~any of the preceding claims~~ claim 1, wherein the layer is a continuous layer.
29. (currently amended) A method according to ~~claim any of the preceding claims~~ claim 1, wherein the layer is substantially crack-free.
30. (currently amended) A method according to ~~any of the preceding claims~~ claim 1, wherein the layer is of uniform composition.
31. (currently amended) A method according to ~~any of the preceding claims~~ claim 1, wherein the layer is of a compound material.

32. (currently amended) A method according to ~~any of the preceding claims~~ claim 1, wherein the layer has a composite structure.
33. (currently amended) A method according to ~~any of the preceding claims~~ claim 1, wherein said ink contains at least one additive to control the rheology of the ink.
34. (original) A method according to claim 33, wherein said at least one additive includes at least one thickening agent.
35. (original) A method according to claim 34, wherein said thickening agent comprises a fugitive soluble organic polymer.
36. (original) A method according to claim 35, wherein said fugitive soluble organic polymer is selected from the group comprising poly(vinyl) alcohol; ethyl cellulose; hydroxyethyl cellulose; carboxymethyl cellulose; methylhydroxypropyl cellulose; hydroxypropyl cellulose; xanthan gum; and guar gum.
37. (original) A method according to claim 34, wherein said thickening agent comprises a non-fugitive material.
38. (original) A method according to claim 37, wherein said non-fugitive material is selected from the group comprising fumed silica and Laponite.
39. (currently amended) A method according to claim 33 ~~any of claims 33 to 38~~, wherein said ink comprises at least one further additive to control further properties of the ink.
40. (original) A method according to claim 39, wherein said at least one further additive comprises at least one of an anti-foaming agent; a levelling agent; a wetting agent; a preservative; an air-release agent; a retarder; and a dispersing agent.

41. (original) A method according to claim 40, wherein said anti-foaming agent is a fugitive material.
42. (original) A method according to claim 41, wherein said fugitive material is selected from the group comprising butyl cellosolve; n-octanol; emulsions of organic polymers and organic metal-compounds; and silicone-free defoaming substances in alkylbenzene.
43. (original) A method according to claim 40, wherein said anti-foaming agent is a non-fugitive material.
44. (original) A method according to claim 41, wherein said non-fugitive material comprises a silicone.
45. (currently amended) A method according to claim 40 ~~any of claims 40 to 44~~, wherein said dispersing agent is selected from the group comprising poly(vinyl) alcohol; modified polyurethane in butylacetate, methoxypropylacetate and sec. butanol; modified polyacrylate in methoxypropanol; polyethylene glycol mono(4-(1,1,3,3-tetramethylbutyl)phenyl)ether; and mineral oils.
46. (original) A method according to claim 45, wherein said dispersing agent comprises a silicone oil.
47. (currently amended) A method according to claim 40 ~~any of claims 40 to 46~~, wherein said at least one further additive comprises at least one dispersing agent and at least one said minor component has an affinity for that dispersing agent.
48. (currently amended) A method according claim 40 ~~any of claims 40 to 47~~, wherein said levelling agent is selected from the group comprising poly(vinyl) alcohol; fluorocarbon modified polyacrylate in sec. butanol; organically modified polysiloxane in isobutanol; and solvent-free modified polysiloxane.

49. (currently amended) A method according to claim 40 ~~any of claims 40 to 48~~, wherein said wetting agent is selected from the group comprising unsaturated polyamide and acid ester salt in xylene, n-butanol and monpropyleneglycol; and alkylol ammonium salt of a high molecular weight carboxylic acid in water.
50. (currently amended) A method according to claim 40 ~~any of claims 40 to 49~~, wherein said preservative is selected from the group comprising phenols and formaldehydes.
51. (currently amended) A method according to claim 40 ~~any of claims 40 to 50~~, wherein said air-release agent is selected from the group comprising silica particles and silicones.
52. (currently amended) A method according to claim 40 ~~any of claims 40 to 51~~, wherein said retarder is selected from the group comprising 1,2-propanediol and terpineol.
53. (currently amended) A method according to ~~any of the preceding claims~~ claim 1, wherein said coating step comprises screen printing.
54. (currently amended) A method according to ~~any of the preceding claims~~ claim 1, wherein said coating step comprises ink-jet printing.
55. (currently amended) A method according to claim 1 ~~any of claims 1 to 52~~, wherein said coating step comprises a step of printing selected from the group comprising offset lithography; pad printing; table coating and slot printing.
56. (cancelled)
57. (currently amended) A thin-film structure that has been created by a method according to claim 1 ~~any of the preceding claims~~.

58. (original) An optical device incorporating a thin-film structure according to claim 57.
59. (original) A sensing device incorporating a thin-film structure according to claim 57.
60. (original) An electronic device incorporating a thin-film structure according to claim 57.
61. (original) An electronic device according to claim 60, being a field emission device.
62. (original) An electronic device according to claim 61, comprising a plasma reactor, corona discharge device, silent discharge device, ozoniser, an electron source, electron gun, electron device, x-ray tube, vacuum gauge, gas filled device or ion thruster.